28 May 1993
1110 Ednor Road
Silver Spring, MD 20905

Federal Communications Commission
Office of the Secretary
1919 M Street, N.W.
Washington, D.C. 20554

Dear Madam Secretary:

I wish to commend the FCC on its attempt to insure access to the spectrum and addressing the long term needs of the non-Government radio community. However, I am very concerned about the proposed rules that are currently under consideration by the Federal Communications Commission (FCC) that directly affects the hobby of countless thousands of U.S. citizens. The proceeding is **PR Docket 92-235** dubbed "**Spectrum Refarming**" and if adopted, those new rules will greatly reduce access to frequencies currently allocated albeit on a secondary basis to radio control (R/C) model useage.

Permit me to provide my credentials. I am the holder of a First Class Radiotelephone license (1964), an Amateur Extra Class license (1964) and I professionally manage the radio spectrum for a U.S. Government agency. Over the years I have learned to view the radio frequency spectrum as a natural resource to be regulated similarly to National Parkland. Like the land, portions of the radio spectrum should remain set aside for recreational purposes and not negotiable to future modifications.

The genesis of R/C frequencies seems to be the Amateur Radio Service. R/C frequencies are allocated several bands including a portion of the 50 MHz band of the Amateur Radio Service; but the bands which concerns me most are 72-73 MHz and 75.4-76.0 MHz. These bands are Nationally allocated on a primary basis to the Fixed and Mobile {Operational Fixed} Services as delineated in Part 2 and Part 90 of the FCC Rules and Regulations. There are however, three Footnotes to the U.S. Table of Allocations, specifically NG 3; NG 49 and NG 56 that indicate that authorized operations in the subject bands not cause interference to the reception of television broadcast stations operating on Channels 4 and 5. These Footnotes exist to satisfy concerns over interference from the Primary service users to broadcast reception in adjacent bands! However, the R/C frequencies in these bands are allocated on a secondary - non-interference basis by Footnote NG 56. These R/C channels are interleaved every 10 kHz in 20 kHz channels to provide sufficient channel separation from the Primary user channels to avoid harmful interference.

Now the FCC wants to create more land mobile frequencies by splitting them into narrower bandwidths and rearranging the existing band plan. The FCC is proposing to reduce the existing 20 kHz channels to 5 kHz channels! *That can be likened to*
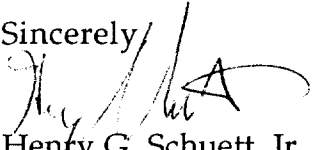
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trying to get 40 pounds of top soil into a bag with a 10 pound capacity! As a result, land mobile channels will move closer to the R/C channels thereby causing interference to sensitive AIRBORNE R/C <u>receive only</u> operations.

I have provided an enclosure that is an <u>elementary</u> technical explanation of the interference potential to these airborne R/C receivers. *It is provided to give insight into the interference environment that R/C modellers operate in.*

I do not think it prudent of the FCC to increase spectrum efficiency by making available 5 kHz channels. I believe a more realistic plan would be a 10 kHz channel plan. This would not only be technically wiser but far less financially burdensome on all users of the spectrum in the bands under discussion. The FCC surely does not think R/C'ers are less important than business users of radio, for you see R/C'ers have a considerable investment in their models and radio equipment too.

Therefore, I suggest the FCC *decrease* the scope of their narrowbanding plan to somewhere above 76 MHz - or - incorporate a more realistic 10 kHz channel plan in the subject bands. The R/C'ers have just gotten over a narrowbanding process just a few years ago and now this is being foisted upon them not only unfairly but with what appears to be little technical forethought! I understand the driver mechanisms for narrowbanding within the FCC due to my work as a professional spectrum manager.

The R/C hobby provides many hours of enjoyment to thousands of people like myself and contributes to the advancement and development of the commercial aviation industry. Please help R/C modellers continue the safe enjoyment of their pastime by requesting that the FCC reconsider its proposal for rechannelling the 72 - 76 MHz band.

Sincerely,

Henry G. Schuett, Jr.

Enclosure

cc:

The Honorable Barbara Mikulski
United States Senate
Washington D.C. 20510

The Honorable Paul Sarbanes
United States Senate
Washington D.C. 20510

The Honorable Constance Morella
United States House of Representatives
Washington D.C. 20515

Enclosure

Technically, this proposal as it stands is unsound !

- The frequency tolerance proposed {50 parts per million (ppm)} will permit cochannel and adjacent channel interference. For example, let's use a 5 kHz emission bandwidth and 50 ppm frequency tolerance. This would allow the carrier center frequency to drift +/- 3.65 kHz at 73 MHz. [Allowable drift of the carrier frequency (F MHz) is calculated as the product of the frequency and the tolerance.] 73 MHz * 50 ppm = 3650 Hz or 3.65 kHz in a 5 kHz channel. **The frequency tolerance should be at least 34 ppm to remain within the proposed occupied bandwidth of 5 kHz.**

- Radiowave propagation loss above 30 MHz with line-of-sight conditions - which is directly applicable in this case - is defined as:

Path Loss = 36.6 + 20 Log (Frequency in MHz) + 20 Log (Distance in miles)
Given: 73 MHz transmitter at 0.5 statute mile.
{I used 0.5 mile since the R/C'er can only "control" what he sees!}

Therefore Loss = 36.6 + 37.26 - 6.02 = approximately 67 dB

The effective transmitted power (ETP) can be determined from the following equation:

ETP = Pt - Llt + Gt +Gr - Llr

Where:
Pt is the transmitter power in dBW ~ 0.5 Watt = - 3 dBW
Llt is the transmission line loss for the transmitter ~ 0 dB
Gt is the gain of the transmitting antenna ~ 0 dB
Gr is the gain of the receiving airborne antenna ~ - 3dB
Llr is the transmission line loss for the airborne receiver ~ 0 dB

Therefore ETP = -3 - 0 + 0 - 3 - 0 = -6 dBW = 0.25 Watt !

Now the actual Received Signal Level (RSL) can be determined using the equation:

RSL = ETP - Path Loss

Therefore RSL = -6 - 67 = - 73 dB

Lets see what it takes to interfere with this airborne receiver.

R/C transmitters may use frequency modulation thus there is a "capture effect". This effect is an aid to reception of the desired signal. Lets see how much power would be required from a Fixed station operating cochannel and 5 statute miles away to overcome the R/C transmitter. Using the same equations the path loss would be 88 dB. The RSL would have to be overridden by 3 dB for capture effect which would mean the RSL would be -70 dB. Breaking the Fixed station down into its constituent parts yields an antenna gain of 6 dB and a transmission line loss on a 100 foot tower of approximately 2 dB. Thus the ETP for the Fixed station would be 18 dBW and the transmitted power level would be approximately 17 dBW or 50 Watts. This is a reasonable value so it would definitely overcome an R/C transmitter's cochannel signal and therefore be the source of harmful interference!.

Nota Bene: Due to the close channel spacing [5 kHz] the adjacent channel rejection would be reduced thus increasing the interference potential. The Off frequency Rejection would be -1 to -3 dB at best in lieu of -12 dB at the existing interleaved channel plan. So if the R/C receiver was receiving an adjacent channel to the Fixed transmitter's frequency, the Fixed transmitter's power level would have to increase to a maximum value of 100 Watts in order to interfere with the R/C receiver. This also is a reasonable value so it would definitely overcome an R/C transmitter's adjacent channel signal and therefore once again be the source of harmful interference!.